

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions and listings of claims in the application:

LISTING OF CLAIMS:

1. (currently amended): A speech decoder for decoding a coded speech signal into a ~~reproduction-decoded~~ speech signal and for reproducing a speech signal using the ~~reproduction-decoded~~ speech signal, the decoder comprising:

a spectral parameter calculating circuit, responsive to the ~~reproduction-decoded~~ speech signal, for calculating spectral parameters based on the ~~reproduction-decoded~~ speech signal;

an excitation signal calculating circuit for calculating an excitation signal and for obtaining a level of the excitation signal, on the basis of the ~~reproduction-decoded~~ speech signal and the spectral parameters;

a smoothing circuit responsive to the spectral parameters and the excitation signal, for smoothing at least one of the spectral parameters and the level of the excitation signal, so as to output the spectral parameters and the excitation signal where at least one is subjected to smoothing; and

a synthesis filter circuit having a synthesis filter constructed with the spectrum parameters output from the smoothing circuit, and for synthesizing the excitation signal by using the synthesis filter, so as to reproduce the speech signal,

wherein the excitation signal calculating circuit, the smoothing circuit, and the synthesis filter circuit operate only in compliance with predetermined conditions.

2. (currently amended): A speech decoder as claimed in claim 1, wherein the excitation signal calculation circuits carries out an inverse-filtering for the ~~reproduction~~decoded speech signal by the use of the spectral parameters, so as to calculate the excitation signal.

3. (currently amended): A speech decoder as claimed in claim 1, further comprising:
a mode-judging circuit for judging a mode of the ~~reproduction~~decoded speech signal by extracting feature quantities from the ~~reproduction~~decoded speech signal,

wherein the predetermined conditions comprise a mode condition that the mode of the ~~reproduction~~decoded speech signal is judged as a predetermined mode by the mode-judging circuit, so that the excitation signal calculating circuit, the smoothing circuit and the synthesis filter circuit operate only when the mode condition is met.

4. (original): A speech decoder as claimed in claim 3, wherein the predetermined mode is silence.

5. (original): A speech decoder as claimed in claim 3, wherein the predetermined mode is “unvoiced sound.”

6. (currently amended): A speech decoder for decoding a coded speech signal into a ~~reproduction-speech~~decoded speech signal and for reproducing a speech signal using the ~~reproduction~~decoded speech signal, comprising:

a spectral parameter calculating circuit, responsive to the ~~reproduction-decoded~~ speech signal, for calculating spectral parameters based on the ~~reproduction-decoded~~ speech signal;

an excitation signal calculating circuit for calculating an excitation signal and for obtaining a level of the excitation signal, on the basis of the ~~reproduction-decoded~~ speech signal and the spectral parameters;

a pitch-prediction circuit calculating a pitch period from one of the ~~reproduction-decoded~~ speech signal and the excitation signal, where the pitch-prediction circuit carries out a pitch prediction by using the pitch period to produce a pitch prediction signal, and where the pitch-prediction circuit calculates a residual signal by subtracting the pitch prediction signal from the excitation signal;

a gain-calculating circuit for calculating a gain of at least one of the pitch prediction signal and the residual signal both output from the pitch-prediction circuit;

a smoothing circuit responsive to the spectral parameters and the gain, for smoothing at least one of the spectral parameters and the gain, so as to output the spectral parameters and the excitation signal where at least one is subjected to smoothing; and

a synthesis filter circuit having a synthesis filter constructed with the spectrum parameters output from the smoothing circuit, the synthesis filter circuit produces a new excitation signal as a proper excitation signal on the basis of the gain, the pitch prediction signal and the residual signal, and thereby the synthesis filter synthesizes the proper excitation signal using the synthesis filter, so as to reproduce the speech signal.

7. (currently amended): A speech decoder as claimed in claim 6, wherein the excitation signal calculation circuits carries out an inverse-filtering for the ~~reproduction-decoded~~ speech signal by the use of the spectral parameters, so as to calculate the excitation signal.

8. (currently amended): A method of reproducing a speech signal, comprising:
decoding a coded speech signal output from a speech coder, so as to produce a ~~reproduction-decoded~~ speech signal;
calculating spectral parameters based on the ~~reproduction-decoded~~ speech signal;
calculating an excitation signal and obtaining a level of the excitation signal, based on the ~~reproduction-decoded~~ speech signal and the spectral parameters;
smoothing at least one of the spectral parameters and the level of the excitation signal, so as to output the spectral parameters and the excitation signal where at least one is subjected to the smoothing; and
synthesizing the excitation signal using the synthesis filter constructed with the spectrum parameters from said smoothing, so as to reproduce the speech signal; wherein
the calculating of the spectral parameters, the calculating of the excitation signal, the smoothing, and the synthesizing are carried out only when predetermined conditions are met, while the ~~reproduction-decoded~~ speech signal is handled as the speech signal when the predetermined conditions are not met.

9. (currently amended): A reproducing method as claimed in claim 8, wherein the calculating of the excitation signal is carried out so that the ~~reproduction-decoded~~ speech signal

is subjected to an inverse-filtering using the spectral parameters, to thereby calculate the excitation signal.

10. (currently amended): A reproducing method as claimed in claim 8, further comprising judging a mode of the ~~reproduction~~decoded speech signal by extracting feature quantities from the ~~reproduction~~decoded speech signal, wherein the predetermined conditions comprise a mode condition that the mode of the ~~reproduction~~decoded speech signal is judged as a predetermined mode.

11. (original): A reproducing method as claimed in claim 10, wherein the predetermined mode is silence.

12. (original): A reproducing method as claimed in claim 10, wherein the predetermined mode is “unvoiced sound.”

13. (currently amended): A method of reproducing a speech signal, comprising:
first step of decoding a coded speech signal output from a speech coder, so as to produce a ~~reproduction~~decoded speech signal;
second step of calculating spectral parameters based on the ~~reproduction~~decoded speech signal;
third step of calculating an excitation signal and obtaining a level of the excitation signal, on the basis of the ~~reproduction~~decoded speech signal and the spectral parameters;

fourth step of calculating a pitch period from either the ~~reproduction-decoded~~ speech signal or the excitation signal, carrying out a pitch prediction by the use of pitch period to produce a pitch prediction signal, and subtracting the pitch prediction signal from the excitation signal to calculate a residual signal;

fifth step of calculating a gain of at least one of the pitch prediction signal and the residual signal;

sixth step of smoothing in time at least one of the spectral parameters and the gain, so as to output the spectral parameters and the excitation signal where at least one is subjected to the smoothing; and

seventh step of newly producing an excitation signal as a proper excitation signal on the basis of the gain, the pitch prediction signal and the residual signal, and then, synthesizing the proper excitation signal by the use of the synthesis filter constructed with the spectrum parameters, so that the speech signal is reproduced.

14. (currently amended): A reproducing method as claimed in claim 13, wherein the third step is carried out so that the ~~reproduction-decoded~~ speech signal is subjected to an inverse-filtering using the spectral parameters, to thereby calculate the excitation signal.